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ABSTRACT

This document contains four papers from a symposium on individual differences in learning. "Novice and Expert Learning: Impact on Training" (Barbara J. Daley) reports on a study in which 20 novice and expert nurses were interviewed to identify their different learning processes and the factors that facilitated or hindered their learning. The need to demystify the study of transformational learning so that human resource development practitioners can study it within organizations and a qualitative research model for studying transformational learning are discussed in "Studying Transformational Learning--It Can Be Done!" (Sharon Lamm). "Understanding Learning Climate in Organizations: A Case Study" (Mirjam A.A.H. van Moorsel, Danny Wildemeersch) reports a on a study of the learning climate in five departments of a Dutch chemical firm that identified two types of learning climates: a standardized, mechanical learning climate and a differentiated, mechanical learning climate. "An Examination of the Dimensionalities and Theoretical Framework of the Gregorc Style Delineator" (Christopher R. Hardy, Albert K. Wiswell, Thomas G. Reio, Jr.) reports on a study based on exploratory and confirmatory factor analyses that did not support the Gregorc Style Delineator's theory, design, scoring method, or accuracy of portraying cognitive learning style. (MN)

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16 **Individual Differences in Learning**

Chair: Val Kosky, University of Scranton

Novice and Expert Learning: Impact on Training
Barbara J. Daley, University of Wisconsin-Milwaukee

Studying Transformational Learning–It Can Be Done!
Sharon Lamm, Lamm Associates, Ltd.

Understanding Learning Climate in Organizations: A Case Study
Mirjam A. A. H. van Moorsel, University of Nijmegen, the Netherlands
Danny Wildemeersch, University of Nijmegen, the Netherlands

An Examination of the Dimensionalities and Theoretical Framework of the Gregoric Style Delineator
Christopher R. Hardy, INNOLOG, Inc.
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March 4 - March 8, 1998
Oak Brook, IL

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Novice and Expert Learning: Impact on Training

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This study examined the different learning processes used by novices and experts. Twenty semi-structured interviews were conducted with novice and expert nurses. Results indicated that novice learning is contingent on concept formation and the feelings novices experience in the context of practice. Expert learning was identified as a constructivist process using active concept integration and self-initiated strategies. Novices and experts also identified different factors that facilitated or hindered their learning.

Professional development patterns have been studied in physicists,(Chi, Feltovich, & Glaser, 1980), pilots (Dreyfus & Dreyfus, 1985), and nurses (Benner, 1982, 1983, 1984, Benner & Tanner, 1987). These studies demonstrated that professionals grow in their chosen career as they gain experience within the context of their work setting. Studies demonstrated that professionals move through a developmental continuum in which they progress from a novice to an expert. For example, in physics (Chi, Feltovich, & Glaser, 1980) studies analyzed the differences between experts and novices in solving physics problems. Findings indicated that "experts initially abstract physics principles to approach and solve a problem representation, whereas novices base their representation and approaches on the problem's literal features" (Chi, et al., 1980, p. 121).

Dreyfus and Dreyfus (1980, 1985) identified that professionals move through five stages of career development which they labeled novice, advanced beginner, competent, proficient and expert. A brief description of these stages is provided here.

In studies with nurses and pilots it was found that novice professionals tend to govern their practice with rule-oriented behavior (Dreyfus & Dreyfus, 1985, Benner, 1982, 1984, Benner & Tanner, 1987). Since novices have little experience with real situations they must rely on the rules they have learned in their prepatory education to function.

As the novice professional moves on to the advanced beginner stage acceptable performance is demonstrated. "This person [advanced beginner] is one who has coped with enough real situations to note the recurrent meaningful situational components" (Benner, 1982, p. 403). Advanced beginners start to differentiate situations but still have great difficulty determining the important from the unimportant.

Competent professionals have usually been in practice 3-5 years. These professionals can organize and plan activities, they are consciously aware of the plan, and feel they have an ability to cope with unpredictable situations.

The proficient professional begins to have a holistic understanding of the work. For example, proficient nurses have an understanding of the client, begin using maxims or short coded statements to describe client care, and pick out aspects of care that stand out.

Finally, the expert professional "has an intuitive grasp of the situation and zeros in on the accurate region of the problem without wasteful consideration of a large range of unfruitful possible problems situations" (Benner, 1982, p. 406). Expert nurses (Benner, 1984) have an unusual perceptual ability to recognize patterns in clinical situations. This pattern recognition goes beyond the theoretical and applies to the uncertainty of real-life situations. Experts also possess the skill of similarity recognition. This is the capacity to recognize similarities in client conditions even though the presenting symptoms or situation may be dissimilar. Similarity recognition includes the ability to draw out similarities in ambiguous situations. Experts also possess a common sense understanding which is a deep understanding of the experience of the client. This understanding is often based on similarities in language, culture, and experience of the expert and the client. Experts also develop a sense of salience which is the ability to determine what is salient for that particular client in a particular situation. All tasks, observations, and interventions are not seen as equally important. Rather, the specifics for that client are identified and acted upon. Finally, deliberative rationality is the "deep web of perspectives that causes them [experts] to view a situation in terms of past situations. Thus, the expert has learned to expect certain events and even selectively to attend to certain aspects of the situation" (Benner & Tanner, 1987, p. 28).

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Even though previous research clearly articulates a pattern of professional development, there are many outstanding and unanswered questions. One of these unanswered questions is: *Do novice professionals learn in a fundamentally different ways than expert professionals*? The purpose of this study was to develop distinctions between the learning processes that underlie the novice to expert continuum of professional practice development.

Significance of the Research

The prevailing wisdom in regard to professional development is that novice professionals will develop based on the experiences they encounter in their work setting. Roger's "adoption of innovation model" (1971, 1983) described how practice changes are initiated after the learner adopts a new idea and transfers it to the practice setting. The conventional view (Cervero, 1988) has been that professionals learn in one setting and transfer that information to their work environment. Schon (1987) expanded this view in his work on the development of reflective practice in professionals, but stopped short of identifying the actual learning processes in reflective practice.

In contrast to the above views, Daley (1997) found in a study of nurses who attended continuing education programs that experienced professionals do not apply or transfer knowledge from theory to practice. Rather, they go through a complicated process of constructing a knowledge base in practice. Constructing a knowledge base involved the integration of thinking, feeling, and acting segments of the professional role. However, in this study (Daley, 1997) novice practitioners did not describe the relationship between continuing education programs and practice the same as experts. Thus, the question addressed in this study was what is different about the way novices and experts learn?

This study is significant because in the United States, business and industry, including health care, spends billions of dollars on the training and development of professionals. "Employers spend over $50 billion per year on formal employee training and education. Approximately $180 billion per year is spent on informal, on-the-job training" (Rowden, 1996, p. 3). Most of this training is targeted at the novice professional and teaching techniques are used that foster the learning of novices. Uncovering the differences between how novices and experts learn, can help shape professional development programs to the most appropriate level and enhance the learning outcomes for different professional groups. Improved learning outcomes have the potential to improve professional services. More specifically targeted education for professionals can lead to a more cost effective delivery of continuing professional education and staff development programs.

Research Questions

A qualitative interpretivist approach (Guba & Lincoln, 1989) was used to study the following research questions:

1. What different learning processes are used by novice and expert practitioners?
2. How do those learning processes contribute to professional practice development?
3. What factors limit, change or alter learning process of novices and experts?

METHODOLOGY

Twenty nurses served as the purposive sample for this study, 10 novice practitioners and 10 expert practitioners. Novices and experts, identified by employers and peers, were invited to participate in the study. Two data collection methods were employed, interviews and clinical narratives. Semi-structured interviews were used to examine how nurses learned to think in clinical practice. Specifically, the interviews probed how novices and experts acquired new information, how they thought in clinical practice, how they learned from experience and how they made connections between different clinical cases. Additionally, novices and experts were asked to write clinical narratives that described actual clinical cases in which they felt significant learning occurred. These narrative addressed the client case, what was learned, how that learning changed or altered their practice and how they learned to learn in practice.

Interview and clinical narrative data were transcribed and analyzed using a modified constant comparative method (Glaser and Strauss, 1973). Data analysis strategies included the use of concept maps, category themes, and a system of matrices to compare group and individual data.

RESULTS

Preliminary findings indicated that novice nurses tend to learn through more formal mechanisms, including review of policy or procedures, attendance at continuing education programs and reading journals. Novices appeared to learn through a process of concept formation. Experts, however, seemed to use more informal mechanisms, including consulting peers and other health care professionals. Experts constructed a knowledge base for themselves in the context of their practice. They obtained information from multiple sources, processed that information through peer-based dialogue, and changed their practice based on the revised meanings they created. Additionally, experts in this study, described themselves in two ways. Some described themselves as "serving their clients" and others described themselves as "a resource to my peers." These descriptions were often influenced by the specific role the expert played in their organization and impacted how the expert learned from their practice.

Different Learning Processes of Novices and Experts The results of this study indicated that novices and experts used different learning processes. Novice learning processes (See Figure 1) tended to be contingent on the process of concept formation and how that process was affected by fear, mistakes and the need for validation. To form concepts, novices described how they spent a great deal of time "just soaking up information". One nurse described how she felt like a "sponge" and continually

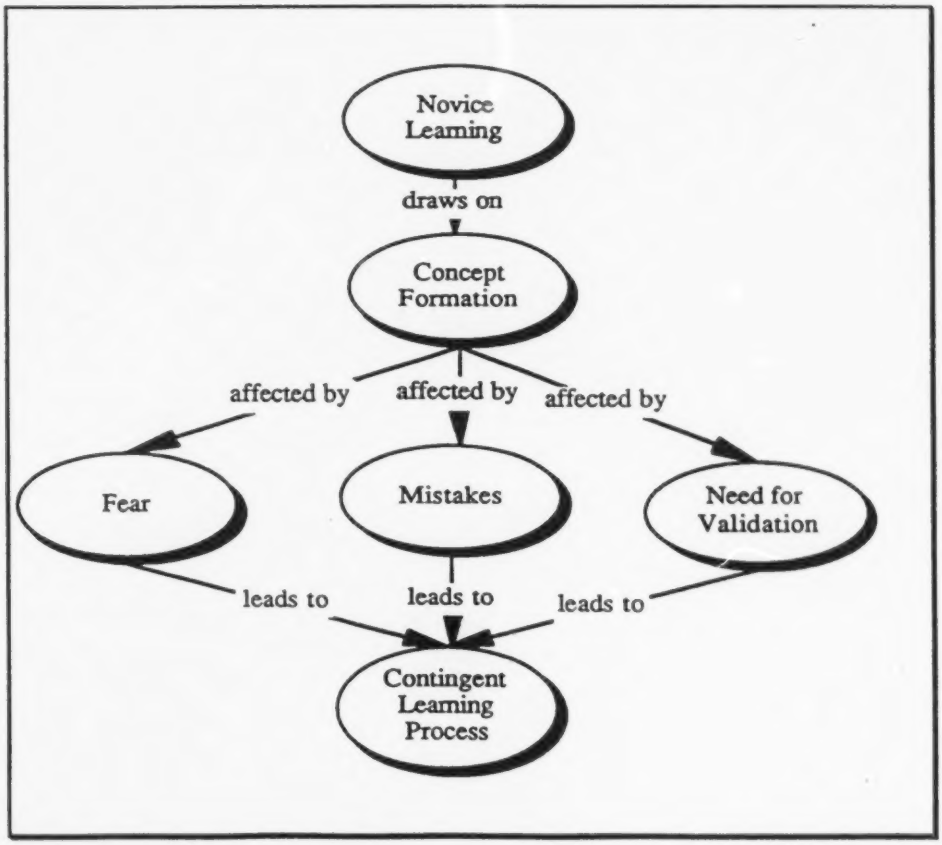

Figure 1: Novice Learning Processes

tried to absorb as much as she could hold. Novices described how they "did not even know, what they did not know" so they would tend to "adapt to the ideas of others". "Everything I am learning is new", stated one novice, "so I just take it in and try to remember it". One nurse stated, "You know it's like that movie, 'just show me the money', well, just show me the procedure! I just need to learn how to do it." In this study, novices described how they were still forming concepts and striving to "sort it all out".

Novices described a process of concept formation similar to that defined by David Ausubel (1978). "In concept formation, the learner generates hypotheses or problem-solving propositions that aim at defining, the abstracted criterial attributes of the concept to be learned" (Ausubel, 1978, p. 100). However, this concept formation process was then affected by the novice's feelings about the context of their practice. Novices described feeling "overwhelmed", "scared to death" and they were "terrified of making a mistake". Novices described how they "needed validation" for procedures and ways of acting in their clinical practice.

Novices used the learning strategies of "asking experts, particularly the physician", "looking it up", and "taking formal courses", but these strategies were used when the novice was directed to do so. Novices indicated that rather than deciding what to learn they waited to be told. One novice indicated, "Sometimes I feel so overwhelmed, I just need to be spoon-fed the information".

Expert learning, on the other hand, tended to be more constructivist learning (See Figure 2).

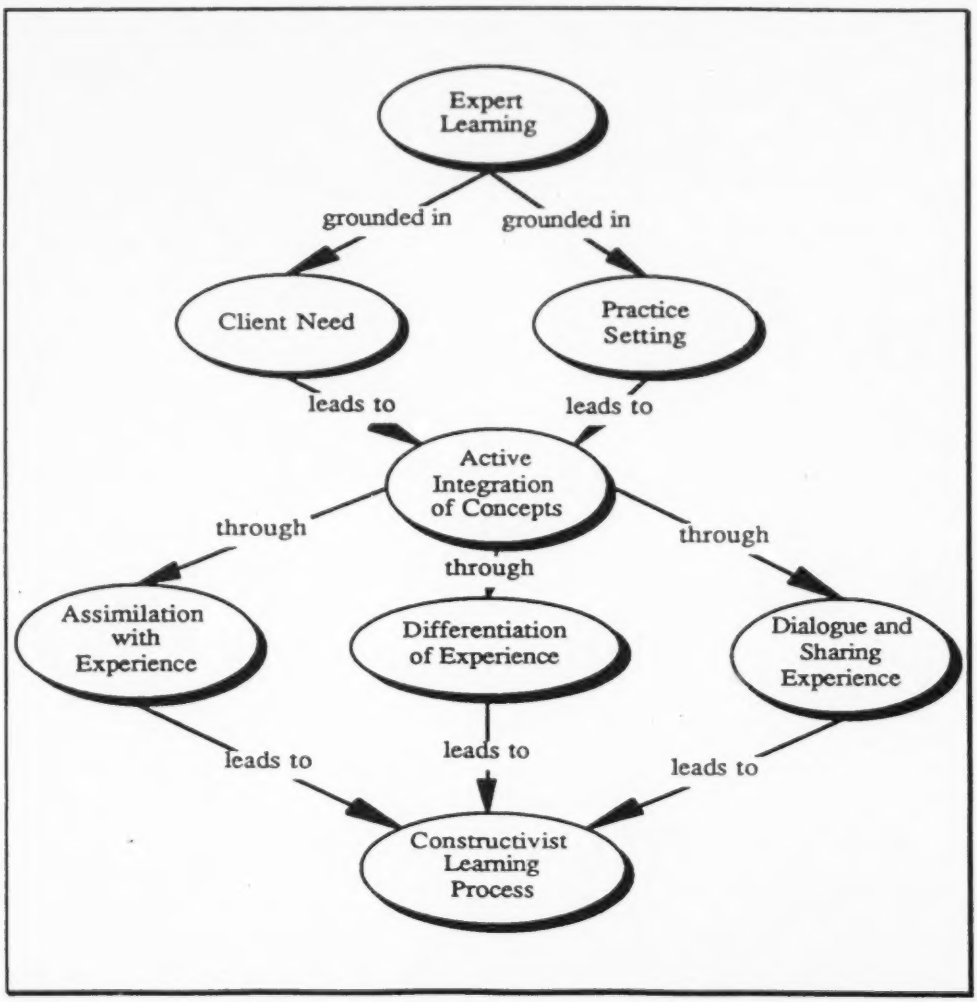

Figure 2: Expert Learning Processes

Experts solidly grounded their learning in the needs of their clients and the context of their practice. Experts indicated that they "had a blueprint in their mind" of what their client needed and would make sure they had the information needed to meet those needs. Experts also indicated that they would actively learn new information because "that is what I need to know to work here". One nurse practitioner described how she identified that she was seeing more and more clients in need of pap smears. Since her educational background happened to be in gerontology, she had not developed this particular skill. The learning action she initiated was to arrange time with the OB-GYN nurse practitioners in her clinic so that she could add this skill to her knowledge base. This nurse took a very active role in seeking out the information she needed to provide care to her clients.

Experts also described that this active integration of concepts included their ability to "improvise", to "pick up little things", to "draw on other professional experiences", and to "draw on personal experiences". Experts indicated that both their personal and professional maturity contributed to being able to "put together the big picture".

Experts viewed formal learning opportunities as "background material" and felt that it was "being in the practice that mattered". Experts would use learning strategies of reading, library research, and discussion with colleagues. The difference was that for experts this was a much more active and self-initiated process. Experts indicated that they would go "searching themselves" for what they needed to learn. One expert stated, "I am at a point in my career where I really teach myself what I need to know".

Experts also used their experiences in a different way. Experts would learn by assimilating new information with their past experiences or by differentiating their experiences from the new information. Experts primarily learned through a process of dialogue and sharing. Experts would "go to the person with the best information, whether the person is a physician or nursing assistant" and then they would "toss around ideas" or "listen to what that person knew". One nurse described that in the home care agency in which she worked each nurse had a desk in a small cubicle. She stated, "Some of my best learning is when I push my chair back, lean around the corner and say to the person next to me, I have a client with thus and so going on, ever run into that? Then we get into this exchange of ideas that is just great".

Experts described their learning similar to constructivist learning processes. Experts used an active process of creating their own knowledge base by seeking out information and assimilating that information with their current knowledge base. This process then changed the character and meaning of both the new information and the previous experience, because the expert would derive a deeper level of meaning and understanding in the process.

Finally, experts indicated that they felt a great responsibility to learn so that they could share information with colleagues. Experts often felt a responsibility to "give something back to the profession by sharing what I know". It was often this feeling of responsibility that motivated experts to search out the most current information on a variety of topics. Experts learned so that they could share and at the same time learned within the process of sharing.

Factors that Support or Hinder Learning Novices and experts identified different factors that support or hinder their learning within the context of professional practice (See Figure 3). Novices identified that formal learning opportunities such as having a nurse educator available, having textbooks on their unit and attending care conferences were supportive. Experts unanimously identified that informal opportunities such as dialogue with colleagues facilitated their learning.

When asked to identify contextual factors that hinder learning novices described specific issues such as time, not enough in-service education sessions, and low staffing. Conversely, experts identified systematic issues such as politics, resources, and organizational structure. For example, one expert described how her agency was split into three specialty areas for service provision. She felt that this hindered learning because staff only learned the specialty, had a very narrow focus, and "there was no cross-over".

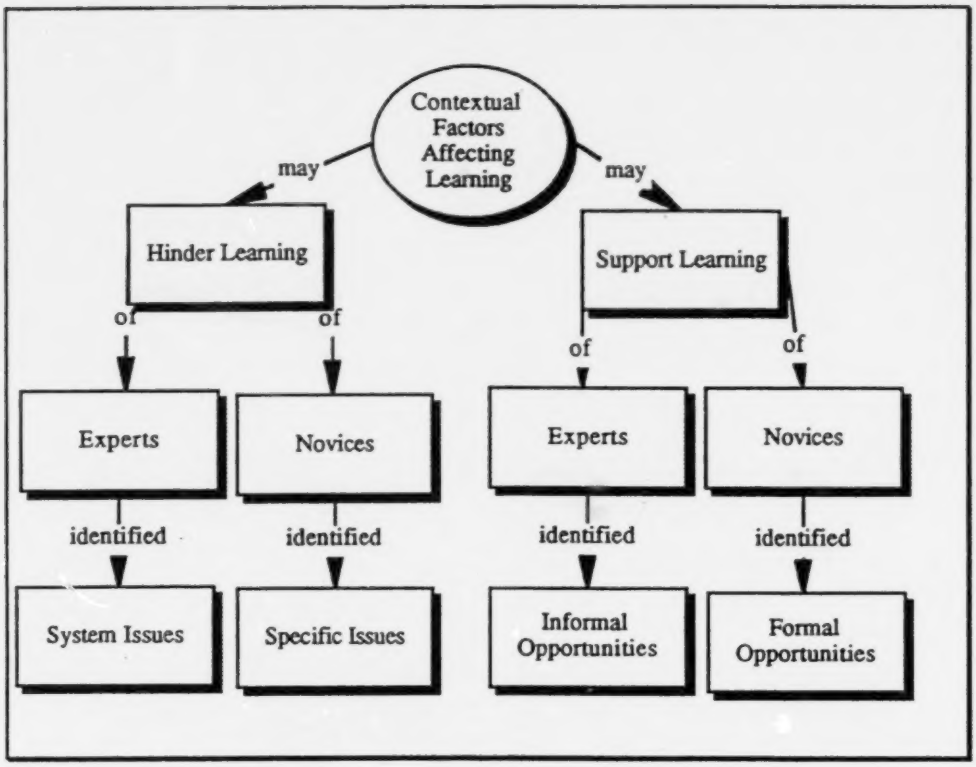

Figure 3: Contextual Factors Affecting Learning

Conclusions and Implications in HRD

This study has implications for learning needs assessment and program planning within training and development departments. First, trainers need to expand their view of traditional learning needs assessment and incorporate more diagnostic skills. Trainers need to be able to assess the learning needs of their audience, as well as, their career stage. Within the assessment of career stage development, trainers could include an assessment of learning processes used by professionals at various career stages. A clear assessment and diagnosis of the learning processes that professionals are using has the potential to allow the trainer to facilitate learning in a more individual fashion.

Second, trainers need to recognize that novices learn in a contingent fashion and that this type of learning is a natural process linked directly to their stage of career development. Trainers can support novice learning by simply providing information, helping the novice set learning priorities and supporting the novice during the time that they feel overwhelmed and fearful.

Third, trainers need to adapt to the constructivist learning processes of experts. Trainers need to provide avenues for experts to search out information, support the informal learning process they develop, and encourage dialogue around clinical cases. However, because experts ground their learning in client needs and the context of practice, the dialogue around cases needs to be grounded in "real" practice examples of the experts involved, not the decontexturalized case studies that are often used in training programs.

Finally, trainers can work to decrease factors that hinder learning and to support factors that facilitate learning. By combining the novice's description of specific factors hindering learning with the expert's description of systematic issues that hinder learning, trainers can work toward broad based organizational change. The expert's understanding of complex systematic issues within organizations and the impact of those systematic issues on the learning of individuals can be a rich resource for trainers.

Additionally, trainers can continue to develop the formal learning opportunities used by novices, while expanding the informal learning opportunities used by experts.

In summary, the findings of this study indicated that the learning processes underlying the novice to expert continuum of professional development will require trainers to be flexible, adaptable, and to develop the ability to facilitate learning by using a wide variety of methods. This study provides trainers with information on how to foster contingent learning for novices and constructivist learning for experts.

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Studying Transformational Learning — It Can Be Done!

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As part of a doctoral dissertation, it was necessary to develop and test a qualitative research model for studying transformational learning. The model represents a practical way to determine whether transformational learning occurred as a result of participating in a corporate leadership program (Action Reflection Learning™). The paper argues for the necessity of demystifying the study of transformational learning, so HRD practitioners can study it within organizations — where fostering transformational learning is increasingly important.

There is little doubt that today's organizations find themselves in the midst of unprecedented change. Powerful global forces are compelling organizations to learn, innovate, and change in order to remain competitive. To be successful in this environment, organizational leaders no longer can continue to do things the way they have in the past. Becoming an effective leader in the complex 21st century "requires movement into critical thought, into the capacity to step outside of one's own assumptions to reflect upon them in a new light" (Parks, 1997, pp. 5-26). In other words, what is needed are executive development programs that foster transformational learning. This is why I chose my dissertation topic — whether and how executive participants of a corporate Action Reflection Learning™ (ARL™) program experienced transformational learning.

The definition of transformational learning used in this paper is: Learning becomes transformative "when assumptions are found to be distorting, inauthentic, or otherwise unjustified. Transformational learning results in new or transformed meaning schemes (points of view), or when reflection focuses on premises, new or transformed meaning perspectives (habits of mind)" (Mezirow, 1991, p. 111). Mezirow was selected as the theoretical framework for transformational learning for two reasons. First, Mezirow represents the most comprehensive transformational learning theory, which integrates a number of theoretical contributions, including Dewey, Freire, Blumer, Kuhn, Gould, and Habermas (Marsick and Finger, 1994). Second, transformational learning seems inherent in ARL™ which is the leadership development program being studied. ARL™ is one approach for fostering Mezirow's premise reflection that can lead to perspective transformation (O'Neil & Marsick, 1994).

As I began to write the literature review for my dissertation, one key question I asked of the current literature, was how does one determine whether transformational learning occurred? I found several transformational learning studies that used Mezirow as a theoretical framework. (See Taylor, 1997, for a comprehensive literature review of many of these studies). With all the transformational learning studies that exist, I thought it would be easy to find data collection and analysis instruments I could replicate or edit. However, as I began to read through some of these studies and related literature, I found a critical piece missing, that being any type of recommended research model (e.g., data collection and analysis instruments) for determining whether transformational learning occurred.

A key theme across many of these studies was the vagueness around determining whether transformational learning indeed had taken place. Some studies included an interview schedule, but little or no explanation around how the researcher used the interviews to determine whether transformational learning had or had not occurred. Interview schedules across the studies were extremely varied with little or no consistency. In studying transformational learning, "there is no body of literature, no easily replicable data collection instruments which have been tested for

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reliability and validity, and no concepts in existence that are generally agreed upon as informing discussion and analysis" (Brookfield, 1991, p. 45). Mezirow (1991, 1997) and Brookfield (1991) agree that transformational learning is very difficult to study.

Although many theorists (Apps, 1996; Boyd and Myers, 1988; Brookfield, 1991; Daloz, 1986; Mezirow, 1991), write about transformational learning, only Mezirow and Brookfield make any mention of how to study it. Even Mezirow's and Brookfield's contributions in this area are limited. Both theorists suggest research methods to use in the study of transformational learning, such as critical incidents, open-ended interviews, and learning journals (Brookfield, 1991; Mezirow, 1991). Neither theorist, however, provides possible data collection or analysis instruments that HRD practitioners could use to evaluate whether transformational learning occurred.

This gap in the literature, left me perplexed. As described above, Mezirow's transformational learning certainly will be a key element in helping today's leaders face ever-changing organizational challenges (Marsick and Finger, 1994). Over $12 billion is spent annually on executive development programs (Bryne, 1991). Many companies expect that an outcome of these costly executive programs will be transformational learning, yet there is no easily replicable research model to determine whether this desired outcome actually is being achieved. There exists a need to demystify and simplify the study of transformational learning.

I had a pressing need to do so, because I had to develop data collection and analysis instruments to begin my dissertation research. After months of drafting, editing, and testing, I finally created a research model that I used to collect data for my dissertation research. I am currently in the process of using the coding scheme (described below) to analyze the data. I can only hope that this model will help HRD practitioners increasingly study transformational learning.

Research question:

Can this research model (e.g., pre-interview form, interview schedule, critical incident, and coding scheme) measure whether transformational learning occurred?

Methodology:

The research model is based on a qualitative case study design of the perceptions of people in one institution. Mezirow (1991) and Brookfield (1991) agree that qualitative rather than quantitative methodologies are best suited for studying the complex phenomenon of transformational learning.

> "Studies that are trying to do something as complex and sophisticated as entering into another's interpretive frame of reference can only be accomplished through talking intensively and lengthily to that person, through watching the person and through reading personal jottings...In other words through interviews, observations, critical incidents and unobtrusive measures such as analyzing learning journals" (Brookfield, 1991, p. 45).

Qualitative transformational learning research has been criticized by quantitative research proponents for not having enough empirical vigor (Taylor, 1997). I disagree with this criticism. If I was conducting a quantitative study, I would run statistics on my data and then tell the story I wanted to tell with respect to these statistics. Instead, I now have 28, 50+ page interviews to read over and over and code line by line, and then have other people test for inter-rater reliability. Inter-raters use the same coding process on about five of the interviews, and we must come to at least an 80% agreement on our assigned codes. This seems like more time and vigor than running statistics.

This research model also is designed for retroactive studies where participants reflect back on their experience, as opposed to observing and recording the learning experience as it actually is happening. In my study, executive participants had completed the ARL™ program from one to six

years ago. While Taylor (1997) calls for more longitudinal transformational learning research, this often is impractical in today's busy and ever-changing corporate world. The amount of time and money required to follow someone for a number of years, often exceeds what a company feels is the benefit of such research. In addition, with the rate of change and turnover, following the same person (in the same company) for a number of years may not be possible.

The research model

The research model consists of a four-step process: 1) a pre-interview form sent to past participants before their scheduled interview, 2) a 90-minute audio-taped interview, 3) a critical incident form sent to at least one co-worker per participant who has worked closely with the participant both before and after the program, and 4) a coding scheme used to analyze the interviews. I tested this model, as part of my dissertation research, with 24 executive ARL™ participants (from five different countries), and 24 co-workers (one per participant). I also conducted interviews with three program learning coaches, and one senior level executive to solicit their opinions on the program and what they feel participants learn from the program.

The pre-interview form was sent to participants about two months prior to their scheduled interview. This form asked participants: 1) for typical demographic data such as race, gender, years and type of experience, and 2) to reflect back on their program experience and write down the most significant thing they learned as a result of participating in the program, as well as, what most helped them to learn this. Many participants commented on the value of completing this form prior to the interview, because it gave them some "think time" to reflect back on their program experience prior to discussing it. This form also gave me, the researcher, time to think and prepare for each interview.

The interview was a combination of some carefully crafted questions, and intuitively knowing when to probe further into a participant's statement. The interview schedule follows.

Table 1: The Interview Schedule

Interview Question	*Rationale for Asking the Question*
1. If I followed you through a typical work day, what would I see you doing differently, if anything, that you may not have done before the program? • Make sure to get a comparison of before and after (i.e., How is this different from what you would have done before the program?)	Mezirow's opinion on whether one's actions change as a result of transformational learning has evolved over time. Mezirow (1991) argued that one does not necessarily have to act in a different way as a result of transforming one's perspective. In a 1997 lecture, he said, "what is key is what are they doing differently as a result of perspective transformation." This question helps to identify this, and also sheds light on how one's thinking may have changed as a result of acting differently.
2. I would like to explore more about how your thinking may have changed as a result of the program. In what ways, if any, has participating in the program caused you to see things differently or think about things differently? • Get before and after comparison and the relationship between different thinking and different actions.	In studying transformational learning, the researcher "must map the learner's initial meaning perspective and compare it with his/her later meaning perspective" (Mezirow, 1991, p. 226). Both question one and two also provide the opportunity for the participant to talk generally and openly about his/her program experience.
3. (Optional - Please tell me more about what you identified as your most significant learning on your pre-interview form _____.	This clarification question was asked only if they did not reference their pre-interview form answer in interview questions one or two.

4. So far, we have talked about many things - what you do differently as a result of the program _____, how you think differently _____, and your answer to the pre-interview question _____. I would like to explore more about one of these things or some combination of them. Which one of these things, or some combination of them, do you see as most significant for you? • What made you choose this/these as most significant for you?	Mezirow (1997a) writes, "Be sure and remember not to ask the subjects to define transformational learning for you. You can ask them to identify their most significant experience but you need to define what they are telling you as indeed a transformation in frame of reference." This question helped the interviewee focus on his/her most significant learning(s). The researcher then can explore more about what helped them to learn this, the course of events that led them to learn this, and whether it is indeed transformational learning.
5. Was this something you expected to learn going into the program, or were you surprised to have learned this? Tell me more?	Daloz (1997) believes that if an individual expected to learn something going into a program, then it may not be transformational learning.
NOTE: Here I asked a few questions around what helped them to learn what they identified as most significant in question four, and what made it difficult for them to learn this.	I am not including these questions, because they deal with the second part of my dissertation (how transformational learning occurred versus whether it occurred that is the focus of this paper).
6. Now let's go back and summarize the course of events that occurred that led you to learn this/change your thinking/actions around this issue (what they identified in question four). Why don't we begin at the starting event — please try to remember back in time to what first caused you to question your previous ways of thinking/acting (or to be open to thinking that maybe your original way of thinking/acting was not the best/only way)? • Help me understand what happened over time to help you do/believe _____ instead of _____ (e.g., what happened before, during - week1_week2_week3_week4, after the program)?	"You must remember that transformations may be *epochal* — transformation in habits of mind triggered by an often traumatic event leading to a disorienting dilemma, or *cumulative* — the result of a progressive, often less dramatic sequence of changes in point of view. I would suspect (cumulative transformations) would be more likely in the context of a particular ARL™ program" (Mezirow, 1997a). Herein lies a very important gap in the current literature. Many existing transformational learning studies use Mezirow's (1991) 10-11 steps in determining whether transformational learning occurred, but these steps only apply to the epochal type of transformation. The literature virtually is silent on what a cumulative transformation looks like. This interview question may help shed light on this.
7. Handout the "during interview leadership reflection" form, and ask interviewee to complete each of the four sentences with a written response. Before the program, 1) The best thing I did as a leader was____, 2) The worst thing I did as a leader was____. After the program, 1) the best thing I do as a leader is ___, 2) The worst thing I do as a leader is ___. Help me understand more about what you wrote? NOTE: If you do the same after the program as before, just write "the same."	As part of my dissertation research, I am particularly interested in transformational learning that occurred around leadership. This question helps get at the comparison of leadership practices before and after the program. In addition, the critical incident form that the co-worker completes includes this same question. This will help directly compare what the participant espouses as the most significant change in leadership practice (if any) to what the co-worker believes/sees.
8. Using a scale of 1 to 5 with 1 being very little change and 5 being very great change, which number best represents how much you have changed, as a leader, as a result of the program? What made you chose the number you did?	This is a nice question to summarize the participant's thinking around how significant of a change was made in his/her leadership behaviors. It can provide additional data for whether transformational learning did indeed occur.
9. Is there anything you might want to add that you think might be helpful?	This question gives the participant an opportunity to add things in an unstructured way.

For those participants that did not experience much significant learning, I focused the interview more toward why not? What prevented you from changing/learning even more?

One key limitation of transformational learning research is "all too often respondents present their espoused theories rather than their theories in use" (Mezirow, 1991, p. 221). To help minimize this limitation, a tailored critical incident form was developed to solicit a co-worker's opinion on how, and how much, the participant had changed. Again, this co-worker was someone who worked closely with the participant both before and after the program. The critical incidents will be analyzed for themes and compared for consistency or inconsistency with the corresponding participant's interview.

To develop the tailored critical incident form, I used the interviewee's transcript to identify three or four things that the interviewee found to be his/her most significant learnings. An example of the tailored portion of the form that went to one participant's co-worker follows:

> In the table that follows are some objectives of the program. Below, please circle the number (in both columns) that best indicates the extent to which you have seen (participant's name) behave in the following ways both before and after the program. Use the following scale and fill in the blank if you have *other* responses.
>
> *1=Almost never 2 = Sometimes 3 = Almost always*

Some Program Objectives	Before Program	After Program
1. Seeks/listens to input from others	1 2 3	1 2 3
2. Facilitates sharing of ideas	1 2 3	1 2 3
3. Takes time to stop and reflect before acting	1 2 3	1 2 3
4. Other:_____	1 2 3	1 2 3
5. Other:_____	1 2 3	1 2 3

In addition to this tailored section, the form also included some standard questions that asked about: 1) the co-workers relationship with the participant, and 2) the amount of change the co-worker observed in the participant. Question seven from the participant interview (see Table 1: The Interview Schedule, above) was included, but was asked from the co-worker's point of view. There were three additional standard questions including:

1) Please check the statement that best represents the degree to which you noticed (insert participant's name) change as a result of participating in the program: ___ I noticed no change in him/her, ___ I noticed some change in him/her, ___ I noticed a great deal of change in him/her.
2) Can you think of a situation after the program where you saw (insert participant's name) act in a different way than he/she would have before the program? ___ Yes ___ No. If no, please go to the next question. If yes, please describe the situation in the space provided below. In your description, please include: A. What happened? B. What did he/she say or do in this situation? C. What effect/results did his/her actions have? D. How might he have handled this situation before the program?
3) If you answered no to the above question, in the space provided below, please describe the most significant things you see (insert participant's name) doing differently, if anything, after the program than before the program?

The final part of the research model is the coding scheme used to analyze the participant interviews to determine whether transformational learning occurred. Although I am still in the process of editing the coding scheme, the current version is presented in the results section below.

Results:

The interview schedule, presented above, worked incredibly well across all 24 interviews. This was pleasantly surprising to me, because my interviewees spanned five different international cultures. Although 20 of the interviewees used English as a second language, there were few language difficulties. I also was surprised by the interviewees' ability to recall specific conversations, even those individuals who participated in the program six years prior. One possible interpretation of this is that the program was very valuable, effective, and memorable. Another interpretation is that having the "think time" with the pre-interview form helped participants recall specific experiences.

What is fascinating is that in at least 85%+ of the cases, what the interviewees picked as the most significant in interview question four (above), was *not* what they originally had put as most significant on their pre-interview form. This could suggest that it is valuable to allow reflection time and some discussion time (see interview questions one through three above) before asking a participant to name their most significant learning/experience.

One caution in using the above interview schedule is *not* to treat it as a purely structured interview. There were many times when I used intuition to ask probing questions that were not on the interview schedule. It is critical to get an interviewee to explain in detail what they mean by their answers, and to compare how they were before the program with how they are after the program. For example, it is not enough to say, "I am now a better team player." What does being a better team player look like? How are you defining a team player? How much of a team player were you before the program? Trying to enter someone's meaning perspectives takes a lot of energy and intense listening. I would recommend not conducting more than two interviews per day and making sure to take a reflection and re-energizing break in between the two interviews.

I am quite happy with the design of the critical incident form, as the forms returned thus far have provided a great deal of useful data. They have been quite easy to analyze and resulted in a high degree of inter-rater reliability. The analysis consists of drawing themes and seeing if there is consistency or inconsistency between co-worker and participant views. In one case the co-worker and participant agreed that: 1) after the program the participant delegated more work to others, and 2) the most significant change was that the participant now demonstrates sensitivity to personal issues of others, whereas before the program, the participant ignored or criticized personal issues of others. In another case, the participant felt that his most significant change was to work for the team benefit versus individual benefit, but the co-worker saw no change in this area. This could mean a number of things, including: 1) there is indeed an inconsistency between the participant's walk and talk, 2) the co-worker is unable to see that the participant has changed, etc.

As of today, I have coded five of the 24 interviews using the coding scheme below. Although five is only about 20% of the total interviews, using this coding scheme has resulted in an inter-rater reliability rating of 80% or above. Table 2 shows some results with using the scheme.

Table 2: Portion of Coding Scheme with Exemplary Quotes

Coding Scheme	*Exemplary Quote*
1. **Levels of learning with illustrative actions** (each level includes a change in thinking/knowledge and a transfer of learning to actions code).	
1.1 Level 1 — Learning within existing points of view	1.1A "I got confirmation during the course, that, uh, working with teams, that - that was one of, let's say…one of the things that I was good in. Having a chance to work with an international group, gave me a little bit more confidence…(that) I can handle…an international team. I can work together."
1.1A Adding knowledge, refining a skill, or further differentiating/integrating ideas within an existing point of view (without replacing points of view/habits of mind).	

1.1B Using specific program tools (e.g., Myers Briggs, stop/reflect breaks).	1.1B "That stop and reflect, I must say, I do that very often."
1.2 *Level 2 - Transformed point of view* (Mezirow's (1991) "everyday type of transformation").	
1.2A An old point of view is replaced by a new point of view.	1.2A "I came to care more about the personal side of my employees. Before the program, I did not care too much about this...all I cared about was getting good results."
1.2B Acting/behaving in a different way that is illustrative of a new point of view (transfer of learning going beyond application of specific tools, but not fundamental enough to be illustrative of a transformed habit of mind).	1.2B "I spent less time before to get everyone to tell his ideas than I do now. I now pay much more attention to that."
1.3 *Transformed habit of mind*	1.3A "I'm a co-dependent person. Specifically care-taker personality. It (the program) helped me heal...my mental illness. I didn't think very highly of myself. I didn't have a great self-image. I guess I thought - when I got accepted into this program - I thought, oh my God, I can't run with the big dogs, and then I found out, hey I can run with the big dogs, and some of these dogs are chasing me. It gave me confidence and awareness that yes I can function at this level. I became self-confident."
1.3A An old habit of mind is replaced by a new habit of mind.	
1.3B Acting or behaving in a different way illustrative of a new habit of mind (acting fundamentally different).	1.3B "You would see me acting with more self-confidence. I did come back (from the program) with a vision of the role that I could play in this organization and not willing to stay where I was...Sort of pushing for a broader role. (Saying to executive management) - Look, I'm not challenged. I'm bored, you know I want to do more...there's other things I can do. I mean before that (the program) I was at a point in my life where I could put up with doing the same old crap for another ten years and then I'll move on. And this (the program) really said, nah, that's a boring way to live. Why settle for that when you can do more?"

Due to space limitations, I cannot provide a similar table for the remainder of my coding scheme, which follows:

2.0 Evidence of transformational learning.
2.1 Process evidence
2.1A Disorienting dilemma (2.1Aa: A life transition, 2.1Ab: New awareness (of alternative points of view or effect on others)
2.1B Exploration/Reflection (2.1Ba: Recognizing one's experience is shared by others, 2.1Bb: Content reflection, 2.1Bc: Process reflection, 2.1Bd: Premise reflection)
2.1C Other course of events constituting transformational learning. NOTE: This code tracks actions/events/processes, other than the above 2.1A and 2.1B, that may indicate a cumulative type of transformation - a less dramatic sequence or accretion of transformed points of view. (2.1Ca Affective event/processes, 2.1Cb Stalling/getting stuck in the transformational process).
2.2 Outcomes as evidence of transformational learning
2.2A Feeling validated in taking new actions or in behaving in new ways.
2.2B Explicitly stating they are changed or different or new
2.2C More differentiated, inclusive, integrated, or permeable habits of mind.
2.2D Not knowing before the program that they would learn this

How this contributes to new knowledge in HRD:

I want to be clear that my intent in presenting this research model is *not* to suggest that: 1) this is the only way to study transformational learning, 2) this is a perfect research model without limitations, 3) Mezirow is without critique (a critique which will be included in my dissertation), or 4) other existing studies are not based on solid research models.

Instead, I had two main purposes in presenting this research model. First, I wanted to contribute to a serious gap I saw in the literature — a discussion of research models that can be used to study transformational learning. Second, this model provides HRD practitioners with something they can choose to use as a starting point, in its entirety, or with critique and edits, as they study transformational learning. If nothing else, I hope to have provided a basis for a critical discussion and an inspiration for others, who have studied transformational learning, to publish their research models.

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Understanding Learning Climate in Organizations: A Case Study

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Employees are implicitly influenced in their learning behavior by the learning climate. This learning climate refers to the norms and values regarding learning that are embedded within the learning network of an organization. In this study the learning climate in five departments is explored. It is found that two types of learning climate can be distinguished: a standardized, mechanical learning climate and a differentiated, mechanical learning climate.

Today, organizations, and especially managers and educators, invest a lot of energy in organizing training and courses for their employees. This effort is, however, not always rewarded, as is shown in the following example:

> A Dutch chemical firm creates an open learning centre for its production workers. In this learning centre, workers increase their employability through a variety of learning activities. Despite the great amount of time and money put in the project, hardly no workers make use of these facilities.

It is our conviction that these disappointing results are due to the fact that managers and educators tend to overlook contextual factors influencing people's workplace attitudes vis à vis learning. In the above mentioned example, production workers don't feel the necessity to learn because their job demands are low and they work in an atmosphere that doesn't encourage learning. Purpose of this study is to explore the learning atmosphere at the workplace or, more specifically, the way in which the learning climate in organizations influences the learning activities.

Theoretical Framework

The concept of learning climate is common in recent literature on work related learning (Argyris & Schön, 1978; Van Biesen, 1989; Egberts, 1991; Knowles, 1973; Van der Krogt, 1995; Marsick & Watkins, 1990; Pedler, Burgoyne & Boydell, 1991; Temporal, 1978). Also, various instruments have been developed to assess the learning climate in organizations (Bartram, Foster, Lindley, Brown & Nixon, 1993; Egberts, 1991; Pedler, Burgoyne & Boydell, 1991). Despite the acknowledgement of the importance of learning climate, hardly no attention is paid to the development of a theoretical basis.

In this study the concept of learning climate is explored on the basis of the learning network theory, which is a fairly new framework (Van der Krogt, 1995). This theory is synthesized as a model in Figure 1. In the learning network theory, a distinction is made between the learning network

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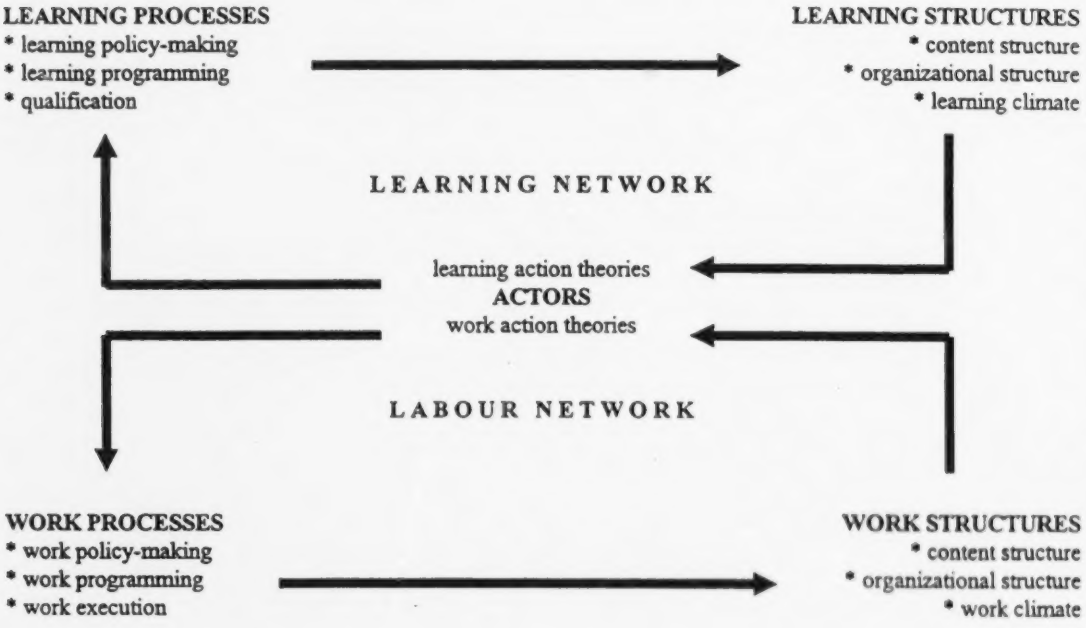
and the labor network within organizations. The learning climate is situated within the learning network of an organization. Below, the concepts of learning network, learning climate and labor network are explained. Also, the relationship between learning climate and the labor network is discussed.



Learning Network The concept of learning network can best be understood with the help of the following example:

> A manager decides that his employees need to learn to use the computer. He contacts an educator to organize a course. This educator hires an external twiner, who teaches the employees. After the course, employees experiment on the computer in the workplace.

This example shows different aspects of the learning network of an organization. First, a learning network of an organization is created by the interaction of different actors in and outside the organization. In the example, actors such as managers, employees and educators are involved in organizing *learning processes*. According to this theory, we can distinguish three constitutive elements of these learning processes: the development of a learning policy, the elaboration of a learning program, and the qualification of the employees.

Second, actors within the learning network act on the basis of their norms and values regarding learning. In the example, the manager considers it important that employees learn to use a computer. As a result of this opinion, he asks an educator to organize a computer course. In the learning network theory, these norms and values regarding learning are called *learning action theories*. The notion of learning action theories refers to the concept of action theories developed by Argyris & Schön (1978).

Third, the norms and values of different actors within the learning network are expressed in *learning structures*. These learning structures consist of a content structure and an organizational structure. The content structure of a learning network refers to the combination of learning activities into learning programs. In the example, two types of learning activities are mentioned. First, the computer course, which can be regarded as a formal learning activity. Second, the experimentation that takes place after the course at the workplace. This can be regarded as an informal learning activity. The organizational structure of a learning network refers to the division of tasks and responsibilities between actors regarding learning. In the example, the manager and the educators are responsible for the way employees learn to use the computer.

Learning Climate In the learning network theory the learning climate refers to the norms and values embedded within the content structure and the organizational structure of the learning network. In the example, a norm embedded within the organization structure would be that 'employees should not carry the responsibility regarding their own learning'. In this study norms are defined as the behavioral guidelines regarding learning. A value underlying the above mentioned norm is 'control'. In the example, the control of the learning of employees is valued. In this study values are defined as 'a collective need to prefer one way of acting above another'.

Labor Network In the learning network theory, the learning network is related to the labor network of an organization. This labor network is similar to the learning network in that actors also interact in processes and create structures on the basis of their norms and values. A difference between the labor network and learning network is that the interactions within the labor network are focused on the organization of work instead of the organization of learning.

Learning Climate and Labor Network An aspect of the learning network theory is that it relates the learning climate to the labor network and, more specific, to the content structure of work. The content structure of work is defined as 'the division of work activities within an organizational department'. As a result of this relationship, it is assumed that the learning climate of a department with group work activities will be different from the learning climate of a department with task work activities. Group work activities come about in organizations which value the horizontal collaboration among employees. Task work activities are dominant in organizations which have a hierarchical orgnaizational structure and a strong division of labor.

Research question

Which norms and values regarding learning can be distinguished within the structure of the learning network of organizational departments which are either characterized by task work activities or by group work activities?

Methodology

Design A multiple case study was applied in five departments, which were selected sequentially (Miles & Huberman, 1994). In three departments group work activities are predominant. The other two departments can be characterized by task work activities. In the five departments, interviews were held and organizational documents were collected. During the interviews, respondents were asked if they had experienced critical incidents regarding learning. The notion of critical incidents is based on the critical incident technique (Flanagan, 1954; Gundry & Rousseau, 1994). Gundry and Rousseau define a critical incident as 'a critical event due to which employees gain insight into the behavioral norms within the organizations'.

Procedure Twenty-two interviews were held from August, 1996 through January, 1997. Respondents ranged from employees to educational advisors and, from personnel advisors to managers. They were chosen on the basis of initial talks with key persons and were selected for their participation in the learning network or labor network. All interviews were based on a topic list, were taperecorded and lasted sixty to ninety minutes. During the interviews, respondents were also asked to report troublesome situations regarding learning (or critical incidents) they had experienced. With

respect to each critical incident, respondents were asked to both give a description (who was involved, what happened) and interpretation of the situation. After the interviews a member check was done (Wester, 1991). This means that a summary was sent to each respondent for correction and confirmation. All the respondents returned these summaries. Organizational documents were collected on departmental and organizational level. These documents varied from organizational charts and annual reports, to educational policy plans.

Analysis The analysis of the interviews was done with the help of a computer program for qualitative data analysis, called Kwalitan (Peters en Wester, 1990). In the analysis, two phases can be

Results

	Organization A *two departments*	Organization B *two departments*	Organization C *one department*
LABOR NETWORK Content Structure of Work	task work	a mix of task work and group work	group work
LEARNING NETWORK Content Structure - Formal learning activities	Task oriented: -product quality training -individual development program -ergonomic training -newcomers' training	Task oriented: -product quality program -machine control program -newcomers' mentorship program Social oriented: -work conference -outdoortraining	Task oriented: -newcomers' program -team exchange program -special programs on f.e. transport Social oriented: -team training -conversation techniques program -work conference -teamcoordinators' program
- Informal Learning activities	Task oriented: -feedback from colleagues to colleagues	Task oriented: -asking questions to colleagues Social oriented: -feedback from the manager to workers	Task oriented/Social oriented: -discussion of progress Social oriented: -feedback from teamcoordinator to workers
Organizational Structure	Main responsibility: -personnel department	Main responsibility: -manager	Main responsibility: -personnel department
Critical Incidents	*'At a given time I attended a course on English conversation. I travelled to this course in my own time. Colleagues considered this stupid. They said: 'You should not do this' (Employee)*	*'I know a boy who has worked here for five years on a certain machine. When I just started to work here I asked him what he was producing. He replied: 'I don't know'. Can you imagine that you have worked here day in, day out for five years, and don't even know what you are producing!' (Allrounder)*	*'In my team we had a problem concerning education. An allrounder was forced to attend a course in order to control a machine. This person refused because he already controlled this machine in his daily work. In the end, the person did not have to attend this course' (Teamcoordinator)*

Table 1: Description of the labor and learning network of the three organizations

distinguished. First, the analysis was focused on a description of the content structure of the labor network, the content and organizational structure of the learning network, and the critical incidents reported in the five departments. As a result of the similarities of the departments within the same organization, final descriptions were made on the organizational level. Second, the description of the learning networks and of the critical incidents was analyzed in terms of the embedded norms and values regarding learning.

Labor Network The description of the labor networks of the three organizations is summarized in Table 1. In organization A, the content structure of work can be characterized as task work. Production workers perform small simple tasks, which are highly specialized. In organization B, the content structure of work can be characterized as a mix of task work and group work. Production workers perform simple tasks. Next to that, a special task force of workers is formed to support the production activities at the workplace. In organization C, the content structure of the work can be characterized by group work. Production workers work together in teams in which task roulation takes place. In each team one production worker, the teamcoordinator, coordinates the production processes and group processes.

Learning Network The description of the learning networks of the three organizations is summarized in Table 1. In organization A, the content structure of the learning network consists of the following four, task oriented, formal learning activities: a product quality training, an individual development program, an ergonomic training and a newcomers' training. Also, one informal learning activity is distinguished. This learning activity is task oriented and is related to the ergonomic training: workers give feedback to each other if they do not perform their work activities in an ergonomical way.

In organization B, the content structure of the learning network consists of five formal learning activities and two informal learning activities. In the formal learning activities, three task oriented learning activities and two social oriented learning activities can be distinguished. The three task oriented learning activities are: a product quality program, a machine control program and a newcomers' mentorship program. The two social oriented learning activities are: a workconference and an outdoortraining. The two informal learning activities are task oriented and social oriented. The task oriented learning activity relates to workers who ask colleagues questions when they want to perform new work activities. The social oriented learning activity relates to the feedback the manager gives to his workers when he thinks they do not take the responsibility for their work activities.

In organization C, the content structure of the learning network consists of seven formal learning activities and two informal learning activities. In the formal learning activities, three task oriented learning activities and four social oriented learning activities can be distinguished. The three task oriented learning activities are: a newcomers' program, a team exchange program and special programs (e.g., on transport).
The four social oriented learning activities are: a team training, a conversation techniques program, a work conference and a team coordinator program. The two informal learning activities are task oriented and social oriented. The first informal learning activity is related to the discussion of teamworkers in teammeetings about the progress that is being made within their team. This learning activity is both task oriented and social oriented. The second informal learning activity refers to the feedback the teamcoordinator gives to this workers when they lack responsibility towards their work activities. This learning activity is social oriented.

The organizational structure of the learning network of the three organizations can be characterized as top down. The main responsibility regarding the learning of production workers is taken by the personnel department (organization A and C) or by the manager (organization B).

Critical Incidents In Table 1, critical incidents are described with respect to each organization. Because of the limited space, only three critical incidents are described. In the original case study, a total of six critical incidents were collected: one in organization A, two in organization B and three in organization C. The critical incidents mentioned in Table 1 are considered to be most representative for the learning climate of the three organizations.

In the critical incident of organization A, an employee remarks that her colleagues considered it stupid that she traveled in her own time in order to attend an English conversation course. In the critical incident of organization B, an allrounder refers to an incident that happened

when he just started working in the department. At a certain occasion he asked a colleague to explain what he was producing. This colleague replied: 'I don't know'. In the critical incident of organization C, a team coordinator mentions an incident that took place in his department some time ago. In this incident an allrounder was forced by the personnel department to attend a course in order to learn to control a specific machine. Because the allrounder already controlled this machine in his daily work, he refused to go. In the end, the allrounder did not have to attend the course.

Norms and values embedded in the learning networks In the content structure of the learning network of organization A, three norms are embedded. The first norm is that 'the content of learning activities should be focused on work processes'. This norm is expressed in all the learning activities mentioned in Table 1. The product quality training, the ergonomic training, the newcomers' training and the feedback from colleagues regarding ergonomic disapproved behavior are all focused on the optimalization of work processes. The second norm embedded in the content structure is that 'workers should attend learning programs at the same time and at the same level'. This norm is expressed in the way workers attend the product quality training and the ergonomic training. The product quality training takes place in a classroom, while the ergonomic training is situated at the workplace. Both learning programs are attended by all workers at the same time and no differentiation is made between workers. The third norm embedded in the content structure is that 'individuals who want to develop themselves within the organization should be supported'. This norm is expressed in the individual development program. In this program, individuals who want to develop themselves within the organization are financially supported in order to attend courses. In the organizational structure of the learning network of organization A, the following norm is embedded: 'Initiatives regarding learning should be taken top down'. This norm is expressed in the way the personnel department takes the main responsibility regarding the learning of production workers.

Underlying the above mentioned norms are the following values regarding learning: uniformity, control and individuality. The value uniformity is expressed in the norm that 'workers should attend learning programs at the same time and at the same level'. The factor underlying this norm is that it is valued that workers learn in a uniform way. The value control is expressed in the norm that 'initiatives regarding learning should be taken top down'. This norm suggests that the control of workers' learning is aimed for. The value individuality is expressed in the norm that 'individuals who want to develop themselves within the organization should be supported'. This norm expresses that individuality regarding learning is valued.

In the content structure of the learning network of organization B and organization C, two norms are embedded. The first norm is that 'the content of learning activities should be focused on work processes and social processes'. This norm is expressed in the formal learning activities and informal learning activities mentioned in Table 1. In organization B, the product quality program, the machine control program, the newcomers' mentorship program, and workers asking questions to colleagues regarding work are alle focused on the optimalization of work processes. In organization C, the following learning activities are focused on work processes: the newcomers' program, the team exchange program, and the special programs (e.g., transport). Other learning activities are focused on the optimalization of social processes. In organization B, these learning activities are: the workconference, the outdoortraining and the feedback from managers to workers with respect to taking the responsibility for their own work activities. In organization C, these learning activities are: the team training, the conversation techniques program, the work conference, the teamcoordinators' program, and the feedback from the teamcoordinators to workers with respect to taking the responsibility for their work activities. The second informal learning activity mentioned with respect to organization C in Table 1, in which teamworkers discuss about the progress that is being made in their team, can be regarded as being focused on both the optimalization of work processes and the optimalization of social processes. The second norm embedded in the content structure is that 'workers should attend learning programs on the basis of their function level'. In organization B, this norm is expressed in the outdoortraining, which is only attended by workers who participate in the task force. In organization C, this norm is expressed in the attendance of workers to the team exchange program, the special programs, the conversation techniques program and the teamcoordinators' program. Attendance of these programs is allowed if workers perform or start to perform a specific function. In

the organizational structure of the learning network of organization B and organization C, the norm that 'initiatives regarding learning should be taken top down' is embedded. This norm is expressed in the way the manager (in organization B) and the personnel department (in organization C) take the main responsibility regarding the learning of production workers.

Underlying the above mentioned norms are the following values regarding learning: differentiation and control. The value differentiation is expressed in two norms. First, the norm that 'the content of learning activities should be focused on work processes and social processes'. Second, the norm that 'workers should attend learning programs on the basis of their function level'. Both norms express that it is valued that the content of learning is differentiated. The value control is expressed in the norm that 'initiatives regarding learning should be taken top down'. This norm suggests that the control of workers' learning is aimed for.

Norms and values embedded in the critical incidents In the critical incident of organization A, two norms regarding learning are confronted. On the one hand, the norm of the colleagues who consider it stupid to travel in your own time in order to attend a course. They think that learning should take place during working hours. On the other hand, the norm of the employee. She considers it legitimate to travel in her own time, because she experiences it to be in her own interest. She hopes that this effort will contribute to a career within the organization.

In the critical incident of organization B, also another two norms are confronted. First, the norm of the colleague who considers it not important to know (or learn) about what he is producing. Second, the norm of the newcomer who considers it important to ask questions in order to learn about his work.

In the critical incident of organization C, two norms regarding learning are confronted. On the one hand, the norm of the personnel department. They consider it important that the allrounder fullfills the educational demands which are related to his function level. The allrounder, however, is convinced of the fact that it is of no use to attend a course when you are already familiar with the content. His norm is that you should learn when there is a need to learn.

Relationship between critical incidents and learning climate With respect to the relationship between the critical incidents and the learning climate, three remarks can be made. First, the findings show that critical incidents provide insight into the socialization of workers, and especially newcomers, with respect to learning. This socialization effect is shown in the critical incidents of organization A and organization B. In the critical incident of organization A colleagues force a worker to obey to their norm that 'you should learn during working hours'. In the critical incident of organization B, a newcomer is implicitly told that 'it is not important to learn about your work'. Second, critical incidents show the tension that can exist due to a particular learning climate. This is shown in the critical incident of organization C. This incident makes clear the tension between a worker who does not want to attend a course and the personnel department who wants him to go. This tension can be regarded as the result of the developments in the content of work within this organization. In organization C group work is developed. A value underlying group work is that workers are responsible for their work. As a result of this growing responsibility regarding work, the worker probably experiences more responsibility for his learning as well. This is expressed in his opinion that 'you should not attend a course if you are already familiar with the content'.

Two types of learning climate On the basis of a comparison of the norms and values embedded in the learning networks of the three organizations, two types of learning climate are distinguished: a standardized, mechanical learning climate and a differentiated, mechanical learning climate. The standardized, mechanical learning climate is characterized by the following norms:

- the content of learning activities should be focused on work processes
- workers should attend learning programs at the same time and at the same level
- initiatives regarding learning should be taken top down

Values underlying these norms are: uniformity, control and individuality.

The differentiated, mechanical learning climate is characterized by the following norms:

- the content of learning activities should be focused on work processes and social processes
- workers should attend learning programs on the basis of their function level
- initiatives regarding learning should be taken top down

Values underlying these norms are: differentiation and control.

Both types of learning climate are related to the content structure of work. The standardized mechanical learning climate is related to task work, while the differentiated, mechanical learning climate is related to group work.

Conclusion

The results of the present study confirm the assumed relationship between the learning climate and the content structure of work (Van der Krogt, 1995). An intriguing aspect of this study, however, is that the learning climate of group work departments is less focused on values as innovation and creativity than would be expected from the literature (Trist, Higgins, Murray & Pullock, 1963; DeSitter, 1994). An explanation of this finding is that the development in the learning climate of departments makes slower progress than the development of labor. Another explanation is that the development of group work is less progressive than it is assumed to be. This explanation is consistent with a recent study on the development of group work in organizations (Fruytier, 1994).

In future research it would be interesting to explore the prevalence of learning climates in which creativity and innovation are valued. Question is whether this type of learning climate is found in group work, or that it appears in, for instance, adhocratic work (Mintzberg, 1983).

Contribution to new knowledge in HRD

This study provides guidance to HRD professionals in diagnosing the learning climate in their organization. A theoretical framework is described in order to look at the education of employees from a contextual perspective. Besides, a case study method is developed to diagnose the learning climate in organizations.

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An Examination of the Dimensionalities and Theoretical Framework of the Gregorc Style Delineator

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The purpose of this study was to examine the dimensionalities and construct validity for the Gregorc Style Delineator using exploratory and confirmatory factor analyses and to test the hypothesis of Gregorc's channel theory as deployed and represented by the instrument. The measurement structures yielded did not support the Gregorc Style Delineator's theory, design, scoring method, and accurate portrayal of one's cognitive learning style.

Even though widely used, is the Gregorc Style Delineator a valid and reliable learning style instrument? Does it measure Gregorc's four channels of how the mind receives and expresses information as proposed by its author (Gregorc, 1984)? Due to its simplicity of design and ease of interpretation, the Gregorc Style Delineator continues to be widely used and accepted as a learning style instrument even though its construct validity has been questioned (O'Brien, 1990; Joniak & Isaksen, 1988). Furthermore, the instrument was included in the Twelfth Edition of the Mental Measurement Yearbook with a mixture of criticism and acclaim (Ferro, 1996).

Regardless of the theoretical basis, the actual measurement of learning style has been problematic (D'Amato, 1992; Gregg, 1989; Bonham, 1987 & 1988; and Curry, 1983). For any learning style instrument to be useful, it must consistently and accurately measure and be able to represent its theoretical conceptualization; does it measure what it is intended? If an author designs a subset of questions (or items) which are intended to represent by their cumulative and unique scores specific traits, characteristics, or styles, then those intentionally related questions should be empirically related to each other (in a correlational comparison) and as a group represent the trait (construct) their relationships are intended to measure. Conversely, they should not be related to other items on the test which are intended by the author to represent different attributes or styles.

The purpose of this study was to examine the dimensionalities and construct validity for the Gregorc Style Delineator using exploratory and confirmatory factor analysis and to test the hypothesis of Gregorc's channel theory as deployed and represented by the Gregorc Style Delineator. The Style Delineator was not developed using empirically rigorous, psychometric methods of test construction and analyses, neither factor-analytic, discriminant, or any other multivariate methods. Since the Gregorc Style Delineator, in spite of these profound developmental shortcomings, is widely deployed and used by educators and trainers world-wide, it is important that the instrument's reliability and construct validity be tested and reported. The Gregorc Style Delineator's internal consistency should be examined and its internal factor structure compared to the intended dimensions of its theoretical framework.

The Gregorc Style Delineator: Theoretical Constructs and Design

Using a phenomenological method to develop a self-analysis tool during his years as a director of a school laboratory, Gregorc (1984) created the Gregorc Style Delineator. This qualitatively designed and developed instrument was intended to identify four separate and distinct channels which the mind receives and expresses information (Gregorc, 1984). These channels were based, theoretically, on two types of mediation abilities of the mind related to perception and ordering. Each of these two channels are comprised of separate bi-polar qualities labeled *abstract-*

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concrete and *random-sequential* respectively. However, the instrument's individual items were purposely designed, according to Gregorc (personal communication, October 28, 1994), only to measure and represent the composite channels and not their separate qualities. According to Gregorc (1982), the coupling of these qualities were theoretically merged and built within his test construction as four distinct and separate transaction ability channels labeled: Concrete/Sequential (CS), Abstract/Sequential (AS), Abstract/Random (AR), and Concrete/Random (CR). In other words, the separate word-items on the instrument's scales are not intended to measure or represent separate qualities such as Concrete or Random or Sequential or Abstract, but theoretically already represent their composites in four separate unions of dimensions or channels (CS, CR, AS, and AR). These special words and word-phrases are phenomenologically derived and supported by over ten years of qualitative research, interviews, case studies and personal experiences (Gregorc, 1982). This distinction is important when analyzing the Style Delineator. Many other instruments are designed to measure the individual items separately, then add combinations together to reach a composite construct, such as the Hardy Educational Learning Profile (Hardy & Hardy, 1998).

In measuring learning style, the Gregorc's channels are represented by the total scores on each channel's scale. The instrument is comprised of 40 items of rank-ordered choices which can be quickly scored. Respondents rank their preferences within each cluster. The rank-order choices are summed by design in accordance to Gregorc's channel theory into four basic channels into a profile depicting a relative order of magnitude representing one's preferred style or styles.

Our Expectations. Since the Gregorc Style Delineator was constructed using 40 psychological laden and derived words or phrases which each group of ten represent one of four composite channels, in our analyses it was expected that exploratory factor item analyses would reveal the four factors consistent with its theoretical channel constructs. The factor structure would be expected to display an orthogonal structure of four factors as separate dimensions. Additionally, we felt that the previous tests of the instrument's dimensionality and robustness had not gone far enough in involving in-depth analyses of the expected internal structures in relation to theory and the actual linear relationships represented in the data set respective of theoretical constructs or channels. Nor have previous studies confirmed Gregorc's theoretical framework which we felt was Gregorc's major contribution to the field of learning style. This study reports a series of factory analyses and attempts to build a confirmatory model for the examination of its dimensions in regard to a diverse sample of adults.

Method

Sample and Data Analyses Sample size requirements were driven by recommended factor analytic conventions in regard to subject to variable ratios and minimum size of samples. It is generally recommended that an adequate or 'rule of thumb' ratio to be at least five cases per variable and a minimum sample size to be 200 (Kline, 1993; Tabachnick & Fidell, 1989). To analyze the Gregorc Style Delineator's 40 items, a total sample of 467 adults was obtained. The total sample (467) was comprised of 187 graduate-level adults in adult education, counseling education in a major university, program management classes at a large government educational institution, and several workshops for professional educators in the Washington D.C. metropolitan area. An additional sample of 280 college faculty and working adult professionals in undergraduate business classes at a Northern Virginia college were obtained. To test factor structure stability each sample yielded similar structures, so we felt comfortable to achieve a larger "n" to pool the samples. This aggregate sample yielded a stable structure and was replicated regardless of extraction method (Tabachnick & Fidell, 1989).

All analyses were supported using EXCEL 4.0 (Microsoft) for data input and data management. A total of 467 protocols were coded and entered into data sets in spread sheet formats. Names and other identifications besides demographic information were not collected or recorded. Data sets were exported into several statistical packages - JMP, SPSS, StatView 4.1 (Abacus) for internal reliability, principle component and factor analyses and EQS for confirmatory factor analyses.

Psychometrics In order to adequately examine the Gregorc Style Delineator, the analyses performed in this study followed very deliberate conventions: demographic frequency distribution analysis, an internal reliability analysis (Cronbach alpha); an examination of the correlation matrix for factorability; a principal component analysis (PCA) for initial factor extractions; and after a scree test was used to help determine the number of factor to retain, an

iterative or common factor analysis for the final extraction, factor stability comparisons, and possible theoretical interpretation. Additionally, confirmatory factor analysis or linear structural equation modeling could be used for specifying, estimating, and testing hypothesized interrelationships matching theory to the instrument (Bentler, 1995). The theoretically expected factors and relationships which are confirmed by the analyses would help to validate the instrument and its theoretical basis (Kerlinger, 1986).

For all non-singular matrixes, a Barlett's significance test was performed with a $p < .05$ desired. This procedure tests the number of factors and evaluates all factors together and each factor separately against the null-hypothesis that there are no factors. Additionally, a communality of factors to variables was examined to determine the amount of variance accounted for by the factors. In all cases, simple solutions were sought seeking stable structures using either orthogonal or oblique rotations. (Kline, 1993 and Tabachnick & Fidell, 1989). A Second Order Factor Analysis was also conducted to explore and support the related oblique constructs which the earlier EFA's seemed to yield. We intended to investigate the interrationhips of Gregorc's original heuristic theoretical model and our Second Order EFA model to build the models to test whether or not the instrument's linear interrelationships within the sample data set tend to confirm the predicted relationships of the structural models.

A good measure of one's learning style as profiled by a questionnaire or survey should consistently and accurately measure its conceptualization. For reliability, regardless whether it is split-half, test-retest, or Cronbach Alpha, one general rule of thumb and accepted convention requires an instrument to have a reliability standard of greater than .70. In regard to measures of validity, when factor analyzed (or other methods of structure analyses) related items should tend group together in the intended dimension and direction as might be reasoned and theoretically anticipated. If the questions or items do not, then what the instrument actually measures is questionable and should be only be used with caution (Nunnally and Berstein, 1994; and Kline, 1993). Factor loadings of .30 or higher on a factor were considered interpretable and .40 or higher were considered salient. The greater the loading the more the variable is a pure measure of the factor and can be useful as a marker variable in the analysis to help define the factor (Nunnally and Berstein, 1994; and Tabachnick & Fidell, 1989). In a confirmatory model, goodness-of -fit indices (CFI) are expected to be .90 or greater (Bentler, 1995). Factor analysis has been widely used and accepted by instrument developers and psychometricians as a construct validity tool (Kline, 1993). Nunnally (1994) and Kline (1993) are critical of instruments which have not been factor analyzed or do not exhibit adequate factor structures when they have been studied in this manner.

Earlier Quantitative Studies. Joniak and Isaksen (1988) attempted to examine the instrument's internal structure using a principle component analysis. Their analysis did not yield evidence of the construct validity of Gregorc's channels. O'Brien's (1990) later analysis yielded minimal structural definition and also did not support the instrument's theoretical constructs. With the exception of Joniak and Isaksen (1988) and O'Brien (1990), all other psychometric analyses have been limited only to Gregorc's (1984) initial minimal assessments made during the instrument's early development in which Gregorc interviewed several hundred subjects. He compared Style Delineator scores with an untested scale of self-assessment agreement which was intended to record the face validity of the instrument for each individual (or the instrument results verses an individual's subjective agreement that their learning style profile tends to fit them). These correlations of the instrument general results and the subjective rated agreement attributes were reported to be between .55 and .76. This specious method alone was used again in a subsequent comparative analysis by the author (Gregorc, 1984) and also yielded "positive" results--29 % strongly agreeing, 57 % agreeing, 14 % unsure, and none disagreeing.

Results

Internal Reliability In this study, internal reliability coefficients (Cronbach Alpha, n = 467) on all scales or channels and ranged from .54 to .68. These reliability coefficients were consistent with those reported by O'Brien (1990) and Joniak & Isaksen (1988) which respectively ranged from .51 to .64 and .23 to .66 on all scales. Gregorc (1984) has advertised much higher reliability data with test-retest correlation coefficients of .85 to .88 and standardized alpha coefficients of .89 to .92 on all scales.

Factor Analyses Since earlier studies were inconclusive in regard to adequately probing and interpreting Gregorc's theoretical dimensions in relationship to the instrument's internal structures, our own investigations sought interpretable structures in relation to theory or in relation to a factor analytic-yielded, stable structure (an underlying structure can be obtained by more than one run or extraction method seeking a persistence of structure and a simple solution, which Thurstone (1947) defined as a factor solution having as high a correlation as possible between variables loading on individual factors, while not loading on other factors).

Principal Component Analyses. Our initial PCA's revealed similar and stable structures regardless of sample decomposition used (187, 280, or 467). Using a Varimax orthogonal rotation to produce the final PCA structure from the aggregate sample of 467, the following represents the interesting and a potentially interpretable structure (eigenvalues of 5.7, 3.0, 2.5, and 2.7 accounting for only .34 of the variance) which tended to be consistent across samples:

Nine of the ten items from the "AR" scale of the instrument clearly loaded inversely on the first factor (-.33 to -.69).

Four of the ten items from the "AS" scale of the instrument loaded positively on the first factor (.32 to .54) and five loaded on the third factor (.34 to .60).

Six of ten from the "CR" scale of the instrument loaded on the second factor(.36 to .51) and four inversely loaded on the third factor (-.32 to-.59).

The "CS" scale of the instrument loaded on the first factor (.32 to .49) and five inversely on the second (-.38 to -.61) factor.

Iterative Factor Analysis. As a result of the above PCA extractions (and for a final check of factor stability), an iterative or common Factor Analysis (FA) was performed, specifying four factors (due to the scree plot results) using an oblique rotation (seeking an improved solution due to the relative promiscuity of the variable complexity ratio of 1.89) which yielded similar results but allowed for a follow-on second order factor investigation. Four factors were extracted having the same eigenvalues to the previous PCA: 5.7, 3.0, 2.5, and 2.7 and still only accounting for over .34 of the total variance. A modest but relatively consistent structure to the PCA emerged:

Five of the ten items from the "AR" scale of the instrument clearly loaded inversely on the first factor (-.43 to -.61) and the fourth factor (-.35 to -.64),

Seven of the ten items from the "AS" scale of the instrument loaded positively on the first factor (.30 to .53) and five loaded on the third factor (.33 to .58).

Seven of ten from the "CR" scale of the instrument loaded on the second factor(.30 to .56) and six inversely loaded on the third factor (-.31 to -.57).

Seven of ten from the "CS" scale of the instrument loaded on the fourth factor (.31 to .58) and six inversely on the second (-.31 to -.60) factor.

Variable complexity (cited above - how many factors are measured by each test item, a value of near "1" is desirable) averaged 1.84 per test item. See Table 1 below:

Table 1

Iterative or Common Factor Analysis, 4 Factors, Gregorc Style Delineator

Items	Factor 1	Factor 2	Factor 3	Factor 4
AR-Aesthetic	0.02	0.05	0.08	**-0.64**
AR-Attuned	-0.13	-0.08	-0.23	**-0.44**
AR-Aware	0.05	**-0.40**	0.06	**-0.35**
AR-Colorful	**-0.47**	0.09	0.03	-0.29
AR-Empathy	-0.25	-0.13	-0.06	**-0.63**
AR-Lively	**-0.61**	0.22	**0.33**	-0.14
AR-Nonjudgmental	-0.08	0.03	0.09	**-0.42**
AR-Person-oriented	**-0.43**	-0.27	-0.15	-0.02
AR-Sensitive	**-0.61**	-0.15	0.06	-0.29
AR-Spontaneous	**-0.56**	**0.38**	0.14	-0.25
AS-Analytical	**0.47**	-0.10	0.02	0.28
AS-Evaluative	**0.35**	0.05	**0.34**	0.09
AS-Ideas	-0.03	**0.47**	0.16	0.13
AS-Judge	**0.31**	-0.01	**0.36**	-0.05
AS-Logical	**0.38**	-0.14	0.16	0.22
AS-Proof	-0.01	0.01	**0.59**	-0.03
AS-Quality	-0.19	-0.01	**0.33**	**0.38**
AS-Rational	**0.53**	-0.15	0.08	-0.04
AS-Referential	**0.30**	0.01	**0.58**	-0.06
AS-Research	**0.46**	-0.02	0.13	-0.01
CR-Creative	-0.21	**0.47**	**-0.34**	0.09
CR-Experimenting	-0.26	**0.56**	-0.03	0.00
CR-Innovative	-0.06	**0.41**	**-0.50**	0.18
CR-Insightful	0.12	0.16	**-0.57**	**-0.30**
CR-Intuitive	0.01	0.07	**-0.57**	-0.17
CR-Multisolutions	-0.02	**0.47**	**-0.31**	0.13
CR-Perceptive	-0.07	0.07	**-0.55**	-0.21
CR-Practical dreamer	-0.15	**0.31**	-0.26	**-0.31**
CR-Risk-taker	0.06	**0.46**	-0.16	0.00
CR-Troubleshooter	0.26	**0.30**	-0.19	-0.16
CS-Careful detail	0.20	**-0.48**	0.15	0.12
CS-Objective	**0.32**	0.06	0.18	**0.40**
CS-Ordered	0.15	**-0.42**	0.02	**0.31**
CS-Perfectionist	-0.02	**-0.50**	-0.01	0.26
CS-Persistent	-0.23	**-0.48**	-0.07	**0.32**
CS-Practical	0.19	-0.15	0.14	**0.40**
CS-Product oriented	**0.30**	-0.06	0.08	**0.37**
CS-Realistic	0.07	**-0.31**	0.06	**0.58**
CS-Solid	0.12	-0.18	0.20	**0.41**
CS-Thorough	-0.05	**-0.60**	-0.10	0.21

Note: Prefixes represent Gregorc constructs or channels: AR is Abstract Random, AS is Abstract Sequential, CR is Concrete Random, and CS is Concrete Sequential.
Bold values: Interpretable .30 or larger, .40 or larger are Salient.

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Second Order EFA. Consistent with previous studies, the above factor structure did not cleanly support the expected four separate factors or constructs (or channels). However, it did provide some interesting structures to probe and some evidence due to the observed inverse loading of possible bipolar relationships in Gregorc's theoretically expected directions between "AR" and "CS" as well as "CR" and CS" (presumably the "R and S"). Using the factor scores from the above analysis, a second order factor analysis was conducted which generally supported the *interpretable* structure. An oblique rotation produced two second order factors (I and II) with eigenvalues of 1.3 and .9 which accounted for .57 of the variance. First order Factors 1, 2, and 4 loaded respectively on Factor I , .63, .81 and .43, and first order Factor 3 loaded on Factor II, .95.

Table 2.
The Results of the EFA's and the Instrument's Internal Structure

Second Order EFA			
Factor I	Factor I	Factor II	(Factor I)
	Iterative Common EFA		
Factor 1 (AS - AR)	Factor 2 (CR - CS)	Factor 3 (AS - CR)	Factor 4 (CS - AR)
+ AS Analytical	+ CR Creative	+ AS Proof	+ CS Objective
+ AS Rational	+ CR Experimenting	+ AS Referential	+ CS Practical
+ AS Research	+ CR Innovative	- CR Innovative	+ CS Realistic
- AR Colorful	+ CR Multisolutions	- CR Insightful	+ CS Solid
- AR Lively	+ CR Risk-taker	- CR Intuitive	- AR Aesthetic
- AR Person-Orien	+AS Ideas**	- CR Perceptive	- AR Attuned
- AR Sensitive	- CS Careful detail		- AR Empathy
- AR Spontaneous	- CS Ordered		- AR Nonjudgmental
	- CS Perfectionist		
	- CS Persistent		
	- CS Thorough		
	- AR Aware**		

Note: Prefixes represent Gregorc constructs or channels: AR is Abstract Random, AS is Abstract Sequential, CR is Concrete Random, and CS is Concrete Sequential.

Iterative EFA Structure: Factor 1 explained by possible bipolar relationships of Sequential (S) and Random (R) items while controlling for Abstract(A) items and Factor 2 explained by Concrete(C) items. Also, the theoretical separate Channels AS, CR, CS, & AR loaded on Factor 1 and 2 in dimension and direction expected) Theoretical Separate Channels AS, CR, CS, & AR loaded on Factor 3 and 4 in dimension and direction expected in regard to Gregorc's conceptionalizations)

Second order Factor I was primarily comprised of Factors 1 and 2, and marginally by 4; and second order Factor II represented Factor 3.

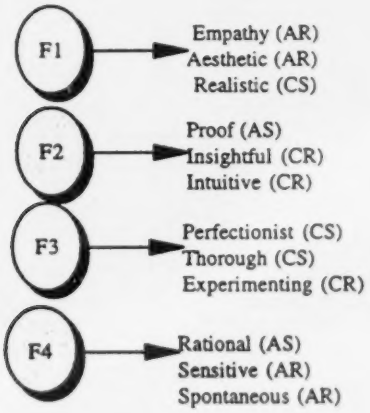
Only 33 of Gregorc's 40 items above are .40 or greater (from Table 1). Seven items which were judged to be not salient or related to any factor: AS-Evaluative, AS-Judge, AS-Logical, AS-Quality, CR-Practical dreamer, CR-Troubleshooter, and CS-Product oriented. Though not designed by Gregorc, "**" items could be semantic-related to other Factor 2 items.

Gregorc's four theoretically separate orthogonal channels or constructs were <u>not</u> clearly depicted or supported by the analysis and in the above structures.

Confirmatory Factor Analysis. Since the EFAs did not provide supporting structural evidence for Gregorc's four channels or constructs, we had to use the factor structures in Table 1

and 2 to determine a model to test and try to support his four channels theory. We selected the three marker variables (each loading above .50 on each factor) as most representative of the four factors consistently identified in our preceding solutions. In the structural model, Factor 1 would be represented by AR Empathy, AR Aesthetic, and CS Realistic; Factor 2 represented by AS Proof, CR Insightful, and CR Intuitive; Factor 3 represented by CS Perfectionist, CS Thorough, and CR Experimenting; and Factor 4 by AS Rational, AR Sensitive, and AR Spontaneous. Using a maximum likelihood extraction, we tested the above hypothesized model, though not cleanly representative of Gregorc's instrument, one could suggest that it could support, thus test his four-channel theory. To our disappointment, our CFA model would not yield, regardless of our best efforts, an acceptable CFI (comparative or goodness of fit index) in comparing our constructed and hypothesized model with the linearalized interrelationships in our test sample of 467 adults.

Table 3.
Proposed CFA Model for the EFA Derived Framework



Conclusions

The instrument's internal reliability coefficients were lower than Gregorc reported on all scales. In examining the internal factor structure of the Gregorc Style Delineator for evidence of the construct validity of Gregorc's four separate channels, none of the scales had high enough loadings to qualify variables as marker variables (near pure representations of the factors). These modest relationships (.30 to -.64) and dimensionalities tended to lack a clear definition between the composite constructs or channels with each other. Consistent with Joniak and Isaksen (1988) and O'Brien (1990), the Gregorc Style Delineator did not display a clear enough structure to validate the instrument's measurement and confirm Gregorc's theoretical interpretation of four learning style channels. However, this study did probe into Gregorc's theoretical conceptualizations. In our analyses, the instrument's most definable characteristic in regard to its internal oblique structure and somewhat explained by the second order EFA was the bipolar and inverse relationships (depicted in Table 1) which, if one ignores the overall internal structures, could be theoretically consistent both in dimension and direction. The second order factor analysis tended to support these interesting interrelationships. However even if one ignores the items loading below .40, one could not effectively argue that the residual items and expressions which comprise these interrelationships might even modestly represent four *different* dimensions or channels of cognitive style as theoretically posited by Gregorc and purported to by measured by the Delineator. For example, the AS items did not load (were not related together) on one dimension, but split loaded on Factor 1 and 3. One can readily observe that the other three channels' salient items were also split. Our attempt to confirm the factor structure and to test an hypothesized channel model of Four factors supported by 12 variables, did not support Gregorc theoretical framework. Additionally, the instrument's average variable complexity ratio of 1.84 also indicated this lack of definition between the factors (reiterating that average item tends to be related to two different factors or channels). Thus, the aggregate values tabulated when one takes the instrument do not correspond

with the "relatedness" evidence of the items representing the separate channels. This could result in an inaccurate representation of one's preferred cognitive style.

The current instrument design and scoring does not support and is not in alignment with the measurement structures yielded from this sample of adults and depicted in our analyses. If these analyses are not unique to this population and these results are indicative of the instrument's general robustness, then Gregorc should consider amending his instrument and replacing suspect and spurious items with better representative ones which are in more alignment with his channel theory and his scoring methodology with its resulting profile.

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